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PATENT SPECIFICATION



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COMPLETE SPECIFICATION

Improvements in or relating to the production of Edible Products from Gluten-containing Flour

I, HANS FERDINAND BAUER, of 1218, Winona Street, Chicago, Illinois, United States of America, a citizen of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to methods for making edible products in which a flour is used. Such products may be either of a yeast leavened or chemically aerated nature similar to breads, cakes, biscuits and other like substances. More particularly, this invention relates to processes for making edible products comprising the treatment of a gluten-containing flour used as a component of such edible products for the purpose of so modifying the gluten content as to facilitate or expedite the subsequent steps in the process of manufacture.

Previously there have been several disadvantages in the utilization of gluten-containing flours, particularly in making edible products. These disadvantages have been found to be inherent in the characteristic of flour itself inasmuch as such disadvantages may be traced back to the relative toughness or lack of tensibility of the dough when formed from gluten-containing flours. That this characteristic toughness of the dough so formed from ordinary flours is one of primary influence in the making of such products can be appreciated when it is realized that the porosity essential to the final product is due to the formation or expansion of gas within the dough or batter generated by a leavening agent such as yeast or a chemical aerating agent such as baking powder. The dough if it is tough and relatively non-tensile is more resistant to an increase in porosity inasmuch as the gases generated within the material are restrained from expanding. There is also the related disadvantage that the toughness of the dough or batter tends to allow an uneven expansion of the gases with resulting uneven porosity in the final product.

A previously available method to over-

come these disadvantages has been to carry on a considerable working of the dough or batter to obtain an even distribution of the gases and to allow a long period of time for their generation and expansion. In using certain agents for increasing the porosity of the dough, for example, yeast, there may be brought into operation after a period of time a mellowing action upon the gluten but this condition only arises, as already stated, after a considerable period of time has elapsed and only by a careful control of the operating conditions and proper working of the dough.

There are other attendant disadvantages which derive from the same source. Due to the fact that previously a relatively long period of processing has been necessary in obtaining a dough or batter of desirable properties, there takes place a chemical deterioration of the flour, which deterioration may result in compounds being formed which have an unpleasant or at least negative taste. Also there has been a considerable loss of reaction products during these operations, some of which result in diminishing the ultimate yield from a given amount of starting materials and which also results in losses of desirable constituents from the final product. This is particularly true in connection with the loss of the fermentation products resulting in making a leavened dough with yeast.

According to the present invention there is provided a process for improving gluten-containing flour comprising mixing with said flour 1% to 7% of flour previously treated with a member of the group consisting of sulphur dioxide, sulphurous acid, sodium bisulphite, sodium meta-bisulphite, sodium pyrosulphite, sodium hydrosulphite, organic addition compounds of sodium hydrosulphite with aldehydes and ketones, and sodium sulphite in an amount not more than the equivalent in gluten softening properties of 1% of sodium sulphite, whereby the gluten content of the entire flour mixture becomes softened.

A flour so treated when mixed with water to form a dough or batter will form

a dough which is more mellow, more ten-
sible and more capable of being
thoroughly and more uniformly aerated
than it is possible to obtain in making a
5 dough from ordinary untreated flour. It
enables edible products to be produced
without the necessity of extended working,
such products having a uniform porosity
and highly desirable characteristics in
10 view of the fact that they have in them
components which would be lost or would
deteriorate during extended dough-form-
ing operations. The products are also
15 free from unpleasant tasting constituents
with the result that the true flavours of
the various flours used are brought out.

It may be pointed out that in the
making of a product, for example, of the
type of bread, there are two general
20 methods used for the preparation of a
dough in which yeast is used as the
leavening agent. These two methods are
namely, sponge dough method and straight
dough method. In the sponge dough
25 method the yeast is mixed with a part of
the flour and allowed to ferment before
the balance of the dough is added to it,
whereas in the straight dough, the entire
batch of dough is made up and allowed
30 to ferment. After the complete dough
batch has been made, the methods used in
further processing have been substantially
the same and are familiar to those skilled
in the art. These subsequent steps con-
35 sist primarily in allowing the ferment to
act within the dough, separating the
dough into desired units and baking them.
However, the difficulties of carrying out
these operations previously have been con-
40 siderable and have necessitated a number
of intermediate operations with consid-
erable pounding and working of the dough
and a great amount of handling from one
machine to another. This procedure has
45 furthermore necessitated considerable
special equipment.

One of the primary reasons for the
necessity of all of the prior processing
which was formerly believed to be neces-
50 sary in making a bread type of product
from a dough fermented with yeast has
been the toughness or non-tensibility of
the dough. The previous processing steps
were carried out to overcome this diffi-
55 culty and to soften the dough by the work-
ing and fermenting action which eventu-
ally brought about an extensibility which
permitted the production of a product
which approached one of uniform porosity.

60 In the making of products from a batter
utilizing a chemical aerating agent, the
same difficulties have arisen, and in order
to obtain satisfactory results, it was
necessary to use sufficient gas forming
65 aerating components to overcome the rela-

tive toughness of the batter due to the
gluten constituents of the flour used.

By means of the present method one is
able to so soften the gluten constituents
of the flour used by preliminary treatment
70 that the disadvantages enumerated above,
due to the dough and non-tensile char-
acter of the dough, are avoided and a
soft extensible readily resilient dough is
obtained which permits a quick and rapid
75 processing and the formation of edible
products which are unique in both physi-
cal and chemical characteristics. The
amount of gluten modifying agent of the
type enumerated above utilized in carry-
80 ing out this process is so small, and fur-
thermore is usually eliminated from the
dough or edible product during subsequent
processing operations that it is substan-
tially undetectable in the final products.
85 Should, however, any of these chemical
components be found to be present, the
amount would be so small as to have no
effect upon the human system, and are
well within the limits allowed by the pure
90 food laws.

The dough softening operations in
making edible products are carried out in
the manner now to be described. A small
amount of one or more of the gluten
95 modifying substances is blended with
only a portion of the flour to be used and
such treated portion is mixed with un-
treated flour and the mixture used in
making up the dough. The flour thus
100 prepared is then made into the dough or
batter, and upon wetting, mixing and
working of the same, the modifying or
mellowing effect comes into effective
action upon the gluten of the flour and
105 a soft, extensible and easily workable
dough or batter is obtained. The subse-
quent operations in using such a modified
dough or batter may be the same as those
which are usually carried out by persons
110 skilled in the baking art. Due to the fact
that the effectiveness of the various gluten
modifying chemicals mentioned vary to
quite an extent and also the gluten con-
tent of flours, and that it is desirable to
115 use a minimum quantity of such a gluten
modifying agent so that its presence will
not affect the product in such a way as
to make it undesirable for food purposes,
one may use in the preferred form of
120 this process sulphur dioxide or sodium
bisulphite to accomplish this purpose.
These last mentioned chemicals are
generally effective in producing the de-
sired effect on the dough when used in
125 quantities of less than 0.00075 per cent.
to the total amount of flour used.

An effective application of this method
of mellowing the gluten content of flours
from the standpoint of the flour miller, 130

would be to treat a flour in the dry state with a sufficient amount of gaseous sulphur dioxide to obtain the desired degree of softening action on the gluten, and subsequently heat or agitate the treated flour to a degree sufficient to drive off any non-absorbed sulphur dioxide that might remain in a free state. This modified flour is used as described above, namely, a portion of such modified or treated flour sufficient to obtain the desired degree of mellowing action, is mixed with untreated flour in making up a dough. For example, by the treatment of 5000 parts of wheat flour in the dry state with one part by weight of gaseous sulphur dioxide, and subsequently agitating the flour for one hour at a temperature of 230° F. to remove any non-absorbed sulphur dioxide, there can be obtained a modified flour product which, when added in proportions of from 1 to 7% to an untreated flour, will mellow the gluten of that flour to a degree suitable for this purpose. The exact percentage or proportion of this treated flour product to be added to the untreated flour depends on the type of flour used, and the purpose for which it is to be applied. As a general rule, it is desirable for best results to use a greater percentage of the modified flour product in conjunction with clear or long patent flours of high gluten content than would be necessary with extra short patent flours of lower and softer gluten content. In this connection it is effective to treat a portion of some protein containing vegetable flour, such as soy bean flour, pea flour, potato flour, and other similar flours with sulphur dioxide, and subsequently heating and agitating to remove any remaining free sulphur dioxide. Such a conditioned vegetable flour is then mixed with a wheat flour, for example, in the proportions of 1 to 7 parts treated vegetable flour to 100 parts of wheat flour in producing a desirable extensible dough. Another preferred method for mellowing the gluten content of flour would be to blend for example, 1 lb. of sodium bisulphite with 1000 lbs. of the flour or material to be treated, for example, wheat flour, rye flour, corn flour, or starch, and then acidify the mixture with an excess of hydrochloric or similar acid required to react with the sulphite salt present. Sulphur dioxide and the salt corresponding to the acid used are the products of the reaction. Subsequently, the mixture is heated in a dextrine converting drum until any non-absorbed sulphur dioxide is driven off, and the starch components of the material are partially dextrinized. Amounts up to the equivalent of 1% of sodium sulphite may be used in accord-

ance with the above described method, and equivalent amounts (in sulphur dioxide content) of the other named gluten modifying substances may be used. The final product obtained in this way is then added to the main portion of the flour to be used in preparing the dough or batter within the limits stated above, the proportions depending upon the degree of gluten modification desired.

One of the very noticeable effects obtained through the use of this invention is the reduction of mixing time. If, for example, a baker finds it necessary to mix a certain flour 15 minutes in order to obtain a smooth dough, he will find that on the use of the preferred portion of the flour treated as described, the necessary mixing time required to obtain a smooth silky dough will be reduced to possibly 9 or 10 minutes, the amount of reduction depending on the proportion of the modifying agent added, or the proportion of the treated flour used.

By means of this process one is able to considerably cut down the amount of time necessary to form a dough or batter and simultaneously eliminate many of the operations which have previously been necessary. The dough which is formed is of such a soft and extensible nature that it rises rapidly. It is also possible to obtain a final product which has a uniform and even porosity of fine multi-cellular characteristics. Products which have not changed in natural flavors of the cereal materials originally added can now be obtained. By means of the operation of conditioning, softening or mellowing the gluten content of the flours used, either in yeast leavened or in chemical aerated food products, the flour is therefore made capable of a thorough and more uniform aeration and made up into a dough in a relatively short period of time as compared with previous operations.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. The process for improving gluten-containing flour comprising mixing with said flour approximately 1% to 7% of a flour previously treated with a member of the group consisting of sulphur dioxide, sulphurous acid, sodium bisulphite, sodium meta-bisulphite, sodium pyrosulphite, sodium hydrosulphite, organic addition compounds of sodium hydrosulphite with aldehydes and ketones, and sodium sulphite in an amount not more than the equivalent in gluten softening properties of 1% of sodium sulphite, 130

whereby the gluten content of the entire flour mixture becomes softened.

2. The process as set forth in Claim 1 in which the preliminarily treated flour is
5 heated to remove any of the resulting non-absorbed treating compound and to partially dextrinize the starchy components of the flour.

3. The process as set forth in Claim 1,
10 the treating compound being a sulphite salt, the mixture of the flour and sulphite

salt being acidified with an excess of acid to react with said sulphite salt, and the mixture being heated to remove any resulting non-absorbed sulphur dioxide and
15 to partially dextrinize the starchy components of the flour.

Dated this 16th day of February, 1938.

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